SEMICONDUCTOR THIN FILM, METHOD FOR MANUFACTURING THE SAME, AND THIN FILM SOLAR CELL

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Abstract of **JP11026789**

PROBLEM TO BE SOLVED: To raise light collection efficiency by forming such thin film as its main component is a solid solution represented in a specified equation. SOLUTION: A main component is Inx X1-x -MgX solid solution of Inx X1-x (X is S, Se, or Te, and x is value of 0-1) and MgX (X is S, Se, or Te). On a soda lime glass substrate kept at 200-300 deg.C, three evaporation sources (In, Mg, and Se) are vapor-deposited at the same time. Here, the evaporation rate of those evaporation sources is set as In; 5 &angst /s, Mg; 5-15 &angst /s, and Se; 20 &angst /s to form a film of about 0.5 &mu m in thickness. The wavelength of absorption end of (In1-x Mgx)2 Se3 solid solution thin film moves to the short wavelength side as x becomes large, to widen band gap. Therefor relating to a solar cell, as a band gap of a film becomes larger, the number of photon P incident on a p-n joint interface increases, thus a current value becomes larger, resulting in higher light collection efficiency.

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[0030] (Example 10) An Mo film with a thickness of 1.0 μm as the electrode was formed on a glass substrate having a thickness of about 2.8 mm by the sputtering method. A Cu thin film and an In thin film were continuously laminated and formed on the Mo thin film by a vacuum deposition method so that the thicknesses of the Cu thin film and In thin film were respectively set to 0.2 μm and 0.5 μm. The laminated body was heated at 550℃ in a sulfur atmosphere for 1 hour to form a $CuInSe_2$ thin film having a thickness of about 2 μm. Further, the In thin film and the Mg thin film were respectively and continuously laminated and formed on the $CuInSe_2$ thin film by the vacuum deposition method. The laminated body was heated in the sulfur atmosphere to form an $(In_{0.87}Mg_{0.17})_2S_3$ thin film having a thickness of about 0.1 μm. A ZnO:Al film (obtained by doping Al of 2 to 3 wt% to ZnO) having a thickness of about 1.0 μm was then formed on the $(In_{0.87}Mg_{0.17})_2S_3$ thin film by the sputtering method. The energy conversion efficiency measured under the light irradiation of 0.1W/cm^2 due to a solar simulator of the solar cell obtained was 6.1%.